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ABSTRACT

An overview of outdoor education, to illustrate its relevance to all subject matter, was presented during a 1-day workshop for public school teachers of Hyde County, North Carolina, by speakers representing resource management agencies, public schools and universities, and environmental organizations. It was suggested that to fully understand the natural world, the individual should experience it first-hand, and that one of the best approaches is through the public school system, as in a program developed by the Fish and Wildlife Service with the Hyde County Public School District, using the Mattamuskeet National Wildlife Refuge. Papers presented (complete texts included in the document) were: Environmental Education Activities of the U.S. Fish and Wildlife Service: Why and Where (answering questions about the importance of environmental education); Environmental Education--the Mattamuskeet Experience; Environment Now! Can You Deal with It?; Operationalizing a Successful Outdoor Education Experience; The Need for Marine Education; People Are a Part of the Picture; Environmental Education in the 1980's. The final paper suggested information sources for teachers, subjects and processes for investigation of the natural world, plus student activities, and provided a 5-page bibliography on plant and tree identification, natural history, general botany, techniques for outdoor education, and basic gardening. (AW/MH)

OUTDOOR EDUCATION FOR K-12:
The What, Why, Where, When, and How

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Proceedings of a Workshop

Co-sponsored by

U.S. Fish and Wildlife Service and East Carolina University

June 17, 1981
Swanquarter, North Carolina

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE*

Edited by
Robert C. Wendling
East Carolina University

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TABLE OF CONTENTS

Page

Environmental Education Activities of the U.S. Fish and Wildlife Service
Conley L. Moffett. 1

Why and Where
Steve Frick. 11

Outdoor Education--The Mattamuskeet Experience
Kelly Nagel. 19

Environment Now! Can You Deal With It?
Bonnie Woodall 31

Operationalizing a Successful Outdoor Education Exercise
Robert C. Wendling 39

The Need for Marine Education
Carolyn H. Hampton and Carol D. Hampton. 47

People Are Part of the Picture
Oris Blackwell 57

Environmental Education in the 1980's
Susan Samson 67

FOREWORD

The purpose of this workshop was to provide an overview of outdoor education to public school teachers of Hyde County, North Carolina. To do so, speakers representing resource management agencies, public schools and universities, and environmental organizations were chosen. The background and training of the speakers varied considerably with the intent of illustrating the relevance of outdoor education to all subject matter.

The timeliness and importance of this workshop should not be overlooked. Though "grassroots" concern for the environment became a nationwide movement in the late 1960's, support began to erode in the late 1970's. However, recent events (e.g., problems related to energy, radioactive and chemical waste disposal, etc.) have rekindled the concern for environmental awareness. In order to fully understand the natural world though, one needs to experience it. One of the best approaches is through development of outdoor education programs within the public school system. The Fish and Wildlife Service, through Mattamuskeet National Wildlife Refuge, is presently involved in developing such a program with the Hyde County Public School District.

As previously mentioned, the papers in this proceedings provide only an overview of the what, why, where, when, and how of outdoor education. Such an endeavor would be beyond the scope of any one-

day workshop. However, the sponsors of the workshop do hope that the interest generated will justify future workshops which focus on the specific outdoor education needs of public school teachers.

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ENVIRONMENTAL EDUCATION ACTIVITIES OF THE U.S. FISH AND WILDLIFE SERVICE

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ABSTRACT: The Fish and Wildlife Service places a high value on all forms of environmental education, both formal and informal, and is striving toward serving all age and interest groups in this effort. It is the firm belief of the Service that the key to success is individual and community action; therefore, the role of the agency is that of a catalyst and not that of a "big brother." Although direct funding to outside interests is not available for environmental education from FWS, assistance is available in the form of certain services and materials. A list of field stations and specific information may be obtained by writing to the U.S. Fish and Wildlife Service.

INTRODUCTION

The mission of the Fish and Wildlife Service is to provide Federal leadership to conserve, protect and enhance fish and wildlife and their habitat for the continuing benefit of people. The Service works to protect ecosystems so that populations and communities of fish and wildlife can survive and flourish.

Over the long term, public understanding and changing public attitudes and perceptions about fish and wildlife will have the single greatest impact on the future well being of fish and wildlife resources in this country. The public must understand the impact of the decisions they make--the effects, short term as well as long term, of their actions.

In order to enhance public understanding and appreciation of fish and wildlife resources, the Service is developing a broad base education program involving all the areas of expertise of the FWS. Education activities will revolve around such things as public participation, interpretation, outdoor classrooms, workshops, technical and general assistance, exhibits and public information. These activities will include a strong emphasis directed toward the understanding of ecosystems and the interworking relationships of these natural systems. The understanding of these systems will lead to a better appreciation for the problems facing fish and wildlife resources and thus a better understanding as to why resources are managed the way they are. The end result, hopefully, will be that people will become responsive and sensitive to the needs of fish and wildlife.

Stated briefly, the goal of environmental education in the U.S. Fish and Wildlife Service is to:

> Establish beneficial and practical ways to enhance public appreciation and understanding of fish and wildlife and their habitats so as to improve public participation in decisions and promote actions to protect and conserve fish and wildlife and their habitats.

LEVELS OF INVOLVEMENT AND ORGANIZATION

Overall guidance for the Service's environmental education effort is supplied by the Washington Office. Regional and area offices carry out aspects of the program such as providing support for educational activities on Service field stations. The over 500 National Wildlife Refuges, National Fish Hatcheries and Research stations form a solid basis for the Service's EE programs by providing educational activities

for school children and the visiting public as well as educational assistance to schools and organizations in areas surrounding field stations.

TARGET AUDIENCES

In the Fish and Wildlife Service EE program, problems are targeted and then potential audiences are examined as part of the analysis to see which educational strategies will help to alleviate the problem. For instance, if the problem is littering along a refuge lake, the target audience might be the people who fish there. If the problem is pollution from agricultural run off, then the audience would be farmers. Strategies and techniques are also tailored to the specific problem. In the first example above, techniques might include news releases about the problem, fishing clinics, and lakeshore interpretive exhibits dealing with litter. In the second example, the techniques might include an active program of working with 4-H and disseminations of information through the Extension system.

Although the focus of the Service's EE program is primarily problem specific, the scope of the program is quite broad and eclectic. The following definitions used for budgeting purposes in the Service define the scope of the program.

> Environmental Education. The process of integrating environmental concepts and concerns into the educational activities of the Service. The purpose of these educational activities is to promote an awareness of the basic ecological foundations for the interrelationships between the human world and the natural systems of which society is a part. The primary goals of the environmental education effort in the Fish and Wildlife Service are to motivate citizens to conserve and enhance our fish and wildlife resources

through active involvement in the decisionmaking process and to understand the role of management in the maintenance of healthy ecosystems.

The Service engages in many educational activities. Program information, interpretation, outdoor classrooms, and educational assistance are all activities dealing with education. When these activities address environmental concerns, incorporate basic ecological concepts, and focus on people's role in the ecosystem (as they should in most cases) then they become forms of environmental education.

Outdoor Classrooms. The use of Service lands (primarily by teacher led groups) for structured educational activities. Examples of activities included in this work element are environmental investigations by school groups, activities by scouts related to conservation merit badges, etc. To be considered part of outdoor classroom activities, all three of the following have to be present:

1. The education activity focuses on the natural environment and people's role in it.

2. The activity is formally structured within an approved course of study, i.e., the reward for the student is a grade, merit badge, etc.

3. The student is involved in a "hands on" field activity on Service lands.

Interpretation. In the U.S. Fish and Wildlife Service, interpretation is an educational activity aimed at revealing relationships, examining systems, and exploring how the natural world and human activities are intertwined. A goal of interpretation is to stimulate additional interest and action. Interpretation is both educational and recreational in nature. That is, participants become involved in interpretive activities because these activities are enjoyable and in the process they also learn about the complex issues facing our fish and wildlife resources. First hand experience with the environment is emphasized, although audio visual media, exhibits, demonstrations, and presentations are often advantageous and necessary components of the program.

Educational Assistance. Efforts aimed at making expertise in outdoor classrooms, interpretation and recreation available to all Service functions, other government agencies, private groups and individuals in their efforts to conserve and enhance fish and wildlife resources. In priority order, the following three functions are included in this element.

1. Working with interested parties to devise educational strategies and programs to deal with important problems facing fish and wildlife resources.

2. Providing techniques, planning assistance, and information to teachers and other professionals involved in educational activities. This assistance may occur on or off-site and may include activities such as teacher workshops, seminars on interpretive techniques, curriculum development, participation in EE councils, etc.

3. In some cases, assistance in the area of recreation planning may also be appropriate. Examples include activities such as serving on a regional tourism council to provide advice on recreation patterns, aiding a veteran's hospital in planning for a wildlife viewing area, helping a service club set up a fishing clinic, etc.

HISTORY OF EE IN THE SERVICE

The Service's land base (refuges, hatcheries and research stations) provided the main impetus for EE activities in the Service. Originally, public use was not encouraged on Service lands. It was not until the end of World War II that heavy use began to develop. In 1951, 3.5 million people visited the National Wildlife Refuges--mostly for recreational activities such as fishing. By 1979 more than 30 million people visited Service installations and EE had become an important on-site activity. In addition EE activities were being pursued by other functions of the Service such as the Endangered Species and Habitat Preservation Programs. Today, EE is becoming an integrated part of all Service efforts to protect and enhance wildlife resources.

METHODS, TECHNIQUES AND PROCEDURES

The following chart gives an overview of procedures used for EE in the Service:

	AUDIENCE	PROGRAM OBJECTIVE	PRINCIPAL TECHNIQUES
Program Information	General Public	Communicate basic information about programs, facilities and activities affecting fish and wildlife.	TV, radio, news releases, films, etc.
Outdoor Classrooms	Students - structured education	Give students opportunities to investigate the environment and existing environmental problems. Can also include 4-H, scouts, etc., engaged in such activities. (Implemented on Service lands.)	Support services and materials to assist professional educators in the use of Service land. Participation to gain a grade, badge, etc.
Interpretation	Recreational Visitor	Better inform the public about the environment and man's role in it. Occurs on or off-site.	Guided walks, films, exhibits, and similar media. Dependent upon voluntary participation by public.
Educational Assistance	Teachers, Other Service Programs, Non-Service agencies and organizations	Provide technical expertise to assist planning and management of interpretation, recreation and outdoor classrooms, and promote awareness of resource problems.	Workshops, conferences, planning meetings, mass media, etc.

ENABLING LEGISLATION

The basic authorities for recreational and educational activities are found in the Recreational Use of Fish and Wildlife Conservation Areas Act of 1962 and in Department of Interior Manual Releases 2187, 518 DM 2. Other authorities such as the Environmental Education Act of 1970, the Recreation Coordination Development Act of 1963, the Wilderness Act of 1964 and the Youth Conservation Corps Act of 1971 deal with education and apply to Service activities. For the most part legal responsibilities are discretionary rather than mandatory in nature.

FUNDING

Funding for environmental education is not carried as a line item in the Service budget. Since EE is integrated throughout the Service, a meaningful dollar figure is difficult to derive.

GRANTS

Although the Fish and Wildlife Service does not provide grant nor other forms of direct fiscal support, assistance in the form of services is available at many field stations. These services include such things as conducting teacher workshops, helping prepare lesson plans, providing technical review and assistance and making FWS lands available for use by schools and other organized groups.

PUBLICATIONS AND MATERIALS

In addition to numerous technical publications, the following materials are available:

We Can Help	A teacher's guide to environmental education activities
Outdoor Classroom	A series of 24 environmental education outdoor activity guides.
Notes on Coordinating A Community Program in Environmental Education	A series of notes of "what worked" for the FWS while helping local people satisfy their educational needs.
Educational Use of Public Lands - Course for Resource Managers	Suggestions for a course to prepare resource managers for the role of being a host to teachers and students and an expediter of environmental education.
Face to Face - Building Programs in Environmental Education	A series of short interviews with educators and land managers who have become active in environmental education programs.
Environmental Education Methods for Teachers	How to set up a credit course with a participating college or university.

Information on these materials is available from Jenny Publishing Company, 57 Queen Avenue South, Minneapolis, Minnesota 55405.

The We Can Help package will be replaced in the near future with a series of packages dealing with environmental problems facing various habitats and with packages on major issues affecting fish and wildlife resources.

As these new materials evolve, the concepts will be integrated into existing Service programs so that the broadest possible spectrum of the American public may be reached.

SUCCESS OF THE PROGRAM

Although the problem oriented approach to EE is relatively new in the Service, some aspects of the program are already being well received. For instance, the Service's outdoor classroom program has proven to be

successful and is generally recognized as being one of the better approaches to Federal involvement in environmental education at the field station level.

Some of the reasons for this success are:

1. It is a community program run by local teachers/ schools. It is not a "big brother" program, since we only provide sites and expertise.

2. Programs are designed to meet local needs as well as to inform the users of broader and more diverse environmental concerns.

3. Large sums of FWS dollars and manpower on a continuing basis are not required for success.

In addition, small scale efforts to use EE as part of the Service's preventive law enforcement program also show great promise.

In the future, success of EE in the Service will depend on how well Service managers accept it as a useful tool and how well it becomes integrated throughout Service management efforts.

Success is also measured by the degree of participation in international programs. Assistance is being provided to several countries in the development of their education programs. This cooperation is expected to expand.

FUTURE PLANS

Environmental education activities, including applicable portions of interpretation, recreation and information, began receiving increased emphasis beginning in FY 1980. Of all permitted public use activities on FWS lands, environmental education activities rank the highest and as such, environmental concerns and the opportunity for environ-

mental understanding will be interwoven into as many public use and public service programs as possible.

WHY AND WHERE

Steve Frick, Refuge Manager
Mattamuskeet National Wildlife Refuge
USDI Fish and Wildlife Service
Swanquarter, North Carolina

ABSTRACT: In order to establish a basis for environmental education, several questions pertaining to the importance of environmental education must be answered. Without understanding the necessity of environmental education, it is difficult to generate the enthusiasm to effectively teach. The basic premise of environmental education is that it effects us all and this awareness should be conveyed to the students. The Fish and Wildlife Service is involved in environmental awareness programs because of the nature of our mandated responsibilities and the interests of the people who make up the Service.

First, I would like to talk to you a little bit about who I work for, the United States Fish and Wildlife Service, Department of the Interior, Division of Wildlife Refuges. The business we are in is the management of some of the nation's natural resources, and regulating and overseeing other resources. We are, in effect, a two-faced agency. We are management oriented in that we physically manage some 35 million acres of land; and we are regulatory in that we provide technical review for development and construction proposals for other agencies and individuals, and enforce several federal laws pertaining to Fish and Wildlife.

The aspect of our operation that I want to talk about today is our management capabilities and programs.

The FWS has several major objectives that we as an agency are directed to pursue. To summarize these, I might say that we are to

manage a network of lands and resources to maintain as near natural conditions as possible to protect and perpetuate a representative and healthy population of flora and fauna. Our main emphasis in wildlife management is migratory waterfowl, endangered species, and big game. Some 90% of our management effort is aimed at migratory waterfowl. The reason for this is that these critters cross too many administrative or judicial boundaries to be managed by a state or local government.

For example, a mallard duck that winters in North Carolina may have nested in Saskatchewan; moved to Minnesota; come across Ohio, Virginia and stopped here. For each state to try to manage through seasons, bag limits, etc., without knowing how many birds were produced, would be chaos. For example, if nesting conditions were poor, fewer numbers of birds would be coming south; seasons would need to be shorter; and probably smaller limits in order to assure two things: first, that each state would get a season; and secondly, and much more importantly, that there would be enough birds left to go north and nest and raise the population levels to a safe plateau. As you can see, this can and does become a problem, both politically and biologically.

One of the reasons I bring this up is not only to give you some idea of the interactions we as resource managers have with people but also hopefully to shed some light on environmental education. Quite obviously, it is easier to talk to a doctor about medical problems than a mechanic and vice versa.

But whoever heard about talking to someone about a duck--very few people; and they more often than not are a special interest group (duck hunters, anti-hunters, etc.). You might ask, "Well who really cares,

how important is a duck, and what will happen if we don't?" I will attempt to answer these questions.

First, let's put the duck in his proper perspective. He is a very small part of an ecosystem we call home. Without him, home has changed.

Who really cares? We all should. Why? He impacts us all in some small way--maybe positively, maybe negatively. On the positive side you have photographers, artists, bird watchers, and hunters. While on the negative side there are industrialists and farmers.

How important is a duck? To whom? To a duck hunter, he is extremely important--important enough that many millions of dollars are spent and contributed to preserve and perpetuate him. Why is this done? There are both good reasons and bad, some solely for economic reasons, others for pure enjoyment or because of a sense of what is right. To some he is important solely for research or as a hobby. There is another reason a duck or any other living thing is important, but that I will deal with later.

How important is it to have wild things? Again I have to ask to whom--to some it is the very essence of life. Some are called eco nuts, environmentalists, etc. You must also realize we have indo nuts, or people who sacrifice all natural things in the pursuit of material things, which in many cases gives us short term gains and irreversible environmental degradation.

However small, natural things are important to us, or touch all of us in some way. We see the inner cities trying to plant trees and flowers. We see the urban population going to the National Parks for vacations. We see national political interest in environmental issues. This shows that wild things are apparently very important to many of us.

How much will it cost to have a duck? This is a question that is extremely difficult to answer. Unfortunately, in today's society, this seems to be the first question that we ask about any item. Most have an economic value, or we can look at a profit loss column and ascertain by these standards whether this is a good investment. With a duck and all wild things, this is extremely difficult to do. Although there are both direct and indirect economic benefits, most do not look at or even realize what the economics of a wild thing can entail. Also, many look at the negative economic influence of wild things. That is, what they can't do because of some environmental concern.

What will happen if we don't have a duck? To many, their hobbies would change; to most, the question would have to be answered by a simple "nothing." But the answer must go deeper than this. If we are willing to tell the duck he does not need to exist, then we are willing to tell the same thing to many other species. We have told many other species through our actions that we do not need them. The extinction of species is increasing at an alarming rate. As a poster on endangered species recently stated "Endangered means there is still time, extinct is forever."

What is their actual value? There are two main areas where we can place a value on wild things: 1) I have mentioned earlier the recreational pursuits of wild things. 2) They are extremely important as environmental barometers. To put this plainly, "If the world in which we live is not fit <u>environmentally</u> for a wild thing to exist in, we are going to have problems."

Over the past four decades, we have literally raped and maimed the environment in which we live. Over the past decade, someone has said, "What are we doing?" We have polluted our air, poisoned our waters, destroyed our forests, littered our countryside and caused incurable health problems. All of this is progress? No, all of this is the great American dream, which plainly states, "more is better." I say to you more may be better, but we must look at what price we are paying for more.

This is where and why environmental education is so important. An uneducated public will not be responsive. We have no alternative but to educate the people of this country as to what the effects of our actions can be.

Environmental education plainly stated is one thing and has one purpose. It is creating an awareness and knowledge of the natural and wild things that surround us; and its one purpose is to give people the background to make wise decisions, and consider the ramifications and alternatives when a natural resource will be affected.

Throughout my brief presentation, I have referred to the duck. The same analogy applies to all natural things, and all should be considered on the same level.

For these reasons, we, the Fish and Wildlife Service, are extremely interested in environmental education. Plainly stated, we cannot do it alone. Environmental management must be a concern of the entire country.

I would like to close with two thoughts that probably will bring environmental education a little closer to home:

1. In Rachel Carson's book "Silent Spring", she referred to Hyde County as the last remaining wilderness on the East Coast. I wonder what she would say today.

2. I would like to read an excerpt from a Youth Conservation Corps publication written by an enrollee, Lisa Young. The title of the article is "Progress."

"I glance out my window with an unsuspecting eye. My view rests upon a shocking scene. On the horizon, towering above the trees, are two booms. They tear the landscape into a million shredded compost piles. "PROGRESS" they call it.

I walk upon the beach with its white sands, their shimmer dulling all too quickly. I look down in front of me, to see a sewer pipe emptying into the sea. "CONVENIENCE" they call it.

I stroll along a path in the woods and come to an unnatural clearing. There are rows and rows of severed stumps. "MANAGEMENT" they call it.

I am drawn by the sound of gunfire. I am led to a truck filled with slaughtered caribou. "CONSERVATION" they call it.

My ears are torn by the roar of a new and faster boat. I look at its wake where there are mutilated birds and fish, that were caught in the propeller. "EFFICIENCY" they call it.

I float upon the ocean and witness the tuna fisherman netting thousands of fish and hundreds of dolphin. The dolphin drown slowly, not understanding this horror that has been dealt them. "INEVITABLE" they call it.

I ramble down a shoreline, where I slip in the thick oil. I observe a bird writhing to stay above water, but losing the desparate battle, because of a lack of use of its wings. Oil spills, 100,000 gallons . . . . . "UNFORTUNATE" they call it.

I watch giant trucks, full of city garbage, dump in the middle of what used to be an untouched, living forest. I wretch at the odor and sight of maggots slithering everywhere. "SANITARY" they call it.

I see a boy slowly dying from cancer. He can only wait until the growth has consumed the life of his body. He was walking in a field next to a nuclear power plant which was designated a "safe level of radioactivity" section. "NECESSARY" they call it.

I see an innocent baby Harp seal beaten to death with a hooked club. His mother yelping, but defenseless. She hovers over her pup's skinned, lifeless body. The fur is so precious. "CHIC" they call it.

I confront them all, enraged and with clenched fists held in the air. I feel something like a hot blade tear through my flesh, smashing me to the ground. There is a viscous liquid pouring out onto one of my fists. It was hot, but soon, I felt nothing. A "RADICAL" they call me."

Lissa Young

The last question I will submit to you is "How important is environmental education?" Again, I must answer a question with a question. How important is the water we drink and the air we breathe?

ENVIRONMENTAL EDUCATION--THE MATTAMUSKEET EXPERIENCE

Kelly Nagel, Biological Technician
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ABSTRACT: Mattamuskeet National Wildlife Refuge recently established an environmental education program in Hyde County, North Carolina to promote environmental awareness. The original program involved four classes of different grade levels and eventually expanded to include a fifth. The refuge plans to develop the necessary skills in key instructors in order to provide an effective on-refuge program initiated by the teachers themselves. Through a natural abundance of varied yet interrelated subject materials, Mattamuskeet Refuge offers an integrated approach to environmental education.

EE Development at Mattamuskeet NWR

In a democracy, the majority rules. Public policy, including environmental policy, should reflect the will of that majority. Environmental education, therefore, is a high priority for those concerned with environmental quality. Only when the majority understands the importance of environmental issues can there be any assurance that society's decisions will be environmentally sound.

The United States Fish and Wildlife Service (USFWS) is concerned with environmental quality; it is also concerned that the majority understands its efforts to maintain this quality. The National Wildlife Refuge system, administered by the USFWS, was created to protect and perpetuate healthy wildlife populations, but it recognizes other objectives as well. One that particularly stands out is the increased emphasis the Service has placed on environmental education. With the

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abundance of outdoor classrooms available through the refuge system, it makes good sense to capitalize on this educational potential.

Consequently, Mattamuskeet National Wildlife Refuge, located in Hyde County North Carolina and long regarded as a place to hunt and fish, has recently been recognized for its suitability as a locally accessible outdoor classroom. In 1979, the Mattamuskeet Refuge initiated an environmental education program within the Hyde County public school system. Refuge staff began the endeavor by presenting local school administrators with a flexible outline of educational goals. Upon review, the proposal was accepted and a trail program was organized with two instructors who had expressed interest in this type of project.

A high school environmental education plan was incorporated into the syllabi for two classes, a tenth grade biology class and an advanced biology course. Both high school classes made monthly visits to the refuge located three miles from the school. During these field trips, students were exposed to field biology techniques, issues of environmental concern, wildlife management processes, and the refuge system in general. Program highlights included extensive study of waterfowl biology, entomology, and plant identification.

With refuge staff guiding the classes, each field trip was preceeded by a unit introduction and followed with discussion and review. As the year progressed, the school instructor was encouraged to initiate on-refuge environmental education programs with minimal guidance from the refuge staff. The refuge staff regarded such

independent use of Mattamuskeet Refuge as one of the program's primary goals, and continued to emphasize its importance with all of the co-operating instructors.

When inclement weather or a particular subject required indoor study, guest speakers and audio visuals materials were brought into the classroom. The historic Mattamuskeet Lodge was often used as a lecture and discussion center for these programs.

Occasionally, students were taken on trips off-refuge to broaden their educational perspectives. For example, students studied fisheries management at Edenton National Fish Hatchery in nearby Edenton, North Carolina, and visited a local fishing house to dissect a thrasher shark which was killed in fishing nets. The majority of students agreed that these outings were worthwhile.

An environmental education plan, somewhat less detailed than the high school's, was also designed for forty-five fourth graders enrolled in a local elementary school. These students were given monthly programs at Mattamuskeet Refuge and occasional in-class presentations. Through these exercises, refuge staff and the instructor attempted to establish a basic knowledge of ecological concepts in the students.

To develop a holistic view of environmental education concepts, individual units which explained certain aspects of the natural world were presented to the fourth graders, and then these separate principles were integrated to convey the interrelationships of life. For example, an investigation concerned with nonrenewable resources was combined with a recycling activity to teach the effects of human interactions

upon the environment. The pilot envrionmental education plan was well received by the students, due perhaps to the enthusiasm of the instructor's attitude which was recognized as essential for a successful program.

Between visits to the elementary and high school, refuge staff also presented occasional programs to a local Head Start preschool. These children were introduced to native plants and animals through these visits and through class activities at Mattamuskeet Refuge, located less than one-half mile from the preschool. Head Start instructors consistently cooperated with the refuge staff to reinforce the basic ideas which were presented to the children.

Overall, the environmental education program had progressed satisfactorily and upon evaluation of its pilot year, school administrators and refuge staff enthusiastically agreed to continue the program in 1980-81.

As word of the program spread, several teachers and students requested that similar programs be incorporated into their courses. Despite the desire of Mattamuskeet Refuge to meet these demands, budget and staff limitations forced the refuge to restrain the growth of its program to minimal additions. Before involving a large number of teachers, refuge staff was determined to develop the environmental education skills of the instructors who were originally included in the program.

For the 1980-81 term, the environmental education program was continued with the two high school classes and the fourth grade class, and was slightly expanded to include a seventh grade life science class.

This addition was made at the suggestion of several educational sources which indicated that the 10- to 12-year-old age group was extremely receptive to environmental education objectives. This class, like the others, participated in monthly programs at Mattamuskeet Refuge and in special activities such as the 1981 recycling drive. As expected, refuge staff found the seventh graders to be an enthusiastic and interested group, which displayed a very positive attitude towards the program's endeavors.

Other classes were conducted similarly to the previous term. Certain units were added or deleted, following the suggestion of staff, instructors and/or students. No major obstacles were met during the 1980-81 term, but the increasing cost of transportation and a few anticipated discipline problems did result in minor annoyances. Administrators corrected these problems by arranging cooperative gasoline payments and assigning disciplinarian duties to the school instructors, rather than to the refuge staff.

During the second term, newly developed USFWS environmental education materials were used in the Mattamuskeet Refuge program. These materials, referred to as "Habitat Pacs" and "Issue Pacs," are being critiqued by refuge personnel across the country and given trial runs at specific refuges such as Mattamuskeet. Pacs which are particularly useful in Mattamuskeet's program deal with estuarine and wetlands destruction, the effects of agriculture on wildlife, and cypress swamp habitat investigations. The USFWS pacs have been especially beneficial to the program as the educational objectives, activities, and instructor overviews are structured in organized and comprehensible formats.

As refuge staff and instructors developed their environmental education techniques, the 1980-81 term proved to be more comprehensive and academically satisfying than the previous term. Five major guidelines which the teachers and staff recognized as necessary for a successful program included: a) field experience teaches objectives in the most lasting and enjoyable style; b) students work best in groups of two to four; c) units are most valuable when presented in a timely manner (e.g., a unit on waterfowl biology should be presented during a period of high lead poisoning fatalities, in order to provide the students with dissectable specimens); d) students are most receptive to environmental education if the instructor takes an active and enthusiastic approach to the subjects being studied; and e) teachers should be encouraged to make maximum benefit of Mattamuskeet Refuge's resources through visits arranged independent of staff assistance.

Other educational concerns have also been recognized during the first two years of the Mattamuskeet Refuge environmental education program. Refuge staff and school administrators agree that environmental study should be presented in a holistic sense, that is, a program should stress the interrelationships of basic ecological concepts rather than assign cut and dry exercises which present particular organisms or phenomena as isolated entities. These activities should be of adequate variety and interest to avoid unnecessary redundancy for students which may be enrolled in more than one of the participating classes during his/her schooling. Also, a measure must be devised to determine the effectiveness of the program over a period of years to insure a quality educational experience for Hyde County students.

Mattamuskeet Refuge: A Dynamic Educational Display

Mattamuskeet Refuge provides year round educational opportunities for students of many ages and interests. With a variety of natural settings, such as marshes, forests, and fields, and with a rich historic background, the educational possibilities at Mattamuskeet Refuge are virtually limitless.

Following USFWS guidelines, the refuge staff has enthusiastically committed itself to sharing these educational riches with instructors and their students. Environmental education units are best approached with seasonal consideration at Mattamuskeet Refuge. Class projects can then be arranged in a manner which takes advantage of climatic variations, and each season provides the students with fresh topics to explore.

To begin the school term, an introduction to the National Wildlife Refuge system and a tour of Mattamuskeet Refuge is appropriate. During this visit, students gain insight into the field of wildlife management and its many ramifications. This is also an opportune time to study the history of Lake Mattamuskeet and in turn to understand the human element in the environment. Indian lore, English exploration, agricultural speculation, and the civil rights movement are topics which combine to describe the Mattamuskeet story.

Fall offers a time for students to explore the basic environmental factors of soil, water, and air. Soils and water investigations can be completed with relatively simple test kits, collecting jars and seines. In addition, weather patterns are easily recorded with student-made wind vanes and rain guages. These units can then be integrated to convey the influence of environmental factors on the biological world.

In order to develop future topics, habitat explorations and comparisons are worthwhile activities to pursue in the fall. Specific activities can be planned to investigate and compare pine forests, fresh and saltwater marshes, cypress swamps, and old fields. Through these studies, students are exposed to the various characteristics of different habitats, and the adaptations which organisms must develop to exist in them. Also, studying plant communities can teach students the importance of the botanical world while developing their classification and data collection skills. Insect collecting is popular during fall and provides the opportunity to compare variations in species and habitats, and to study life cycles, food chains, and anatomy.

Due to the abundance of nongame wildlife species native to Mattamuskeet Refuge, it is valuable to understand their requirements and populations characteristics. Similarly, knowledge of game species and related hunting regulations is a useful lesson. USFWS staff and North Carolina wildlife officers are available to discuss these species and the federal and state wildlife regulations which protect them. Both nongame and game species can be studied at Mattamuskeet Refuge with basic field equipment such as small mammal live traps and binoculars, and by laboratory exercises such as preparing track casts and study skins.

As waterfowl flock to Lake Mattamuskeet and signal the onset of winter, students are given the timely opportunity to study several interrelated aspects of waterfowl biology. To begin this unit, students are introduced to waterfowl identification and management techniques to form a basis for further studies. Population, mortality,

and migration characteristics can be reviewed to understand the world of waterfowl and to assess human effects on these characteristics. Students are acquainted with the anatomy and forage habits of waterfowl by performing necropsies on collected specimens and by analyzing gizzards extracted from ducks bagged during the refuge hunt. At the same time, the students are confronted with current environmental issues such as the lead shot-steel shot and the hunting-antihunting controversies. Obviously, Mattamuskeet's waterfowl resource offers many potential educational activities.

Other species wintering at Mattamuskeet Refuge include the endangered bald eagle and peregrine falcon. These species and others such as the American alligator and red-cockaded woodpecker, are hard-core examples of the effects of human intervention on North Carolina's habitat, and therefore deserve careful study.

Winter, wildlife, and photography go hand-in-hand at Mattamuskeet Refuge. A unit which teaches basic photography techniques can develop the students' communication skills, while disseminating an appreciation for the earth's resources. Two photography blinds, which are located in areas of typical wildlife concentration, are available for students' use at the refuge.

As winter turns to spring, ornithological studies become quite appropriate. Students are introduced to bird identification, populations, and territoriality, through a series of observational exercises. Other activities which expose students to the avian world include the construction of songbird nest structures and the preparation of study skins from specimens donated by Mattamuskeet Refuge. In addition, an

abundant raptor population provides students with the opportunity to study predator-prey relationships which reinforces the integral principles of food chains and energy exchange.

Reptile and amphibian collecting is an enjoyable activity during spring and seems to captivate the majority of classes. Swamp tromps and afterdark marsh investigations are possible outings which can be arranged to study creatures such as snakes, frogs, and salamanders. Again, this particular unit can be integrated with specific habitat units to correlate environmental interrelationships.

Spring is also a suitable season to study fresh and saltwater habitats. By wading along Lake Mattamuskeet's shore, students can collect aquatic specimens and study the freshwater communities. A visit to Swanquarter Refuge, located 10 miles west of the school, sets the scene for an estuary investigation. Using dip nets, seines, and field guides, Swanquarter Refuge can be studied from its salt-sprayed islands to its fluctuating tidepools and creeks.

Easily integrated into the spring agenda is a unit dealing with the principles of fire ecology and succession. Since the refuge and area landowners frequently use fire as a management tool, the effects of burning or its suppression are relevant to the study of the North Carolina coastal plain.

Nestled in the heart of an area where agricultural importance is rapidly increasing, Mattamuskeet Refuge encourages students to research current and predictable land use conflicts. Students can study a variety of related topics such as the effects of farming on wildlife, biological farming techniques, and the consequences of widespread land clearing.

As in many other exercises, the students should carefully consider the human element in order to develop their sense of environmental stewardship.

Because of its natural diversity, Mattamuskeet Refuge can provide educational opportunities on any day of the year. Subjects which can be studied at the refuge are limited only by the imagination, and most field materials are easily constructed or available through the refuge headquarters.

In addition to structured environmental education classes, Mattamuskeet Refuge periodically offers its educational services to other classes, scouting troops, and college students. Guest speakers, movies, and demonstrations are presented to these groups whenever possible and are considered an effective means of increasing the environmental awareness of our future leaders.

The USFWS is concerned with quality. A high standard of environmental quality within a natural wildlife refuge benefits more than its birds or mammals or fish; it benefits all creatures which may contact the refuge in any way and at any time. This of course includes human beings, the species which has assumed stewardship of the earth. Wise decisions involving this stewardship, the ultimate of responsibilities, requires a wise majority.

As Mattamuskeet Refuge exemplifies, a National Wildlife Refuge is more than a haven for wildlife, more than a place to hunt or fish; a National Wildlife Refuge is a place to experience life on display, a place to begin the quest for environmental wisdom.

ENVIRONMENT NOW! CAN YOU DEAL WITH IT?

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ABSTRACT: Nationwide, professional educators are realizing that the day for environmental emphasis has come. Though society's focus is on the environment, it is often obvious that a basic understanding of ecological concepts is lacking. One way to help in eliminating this dilemma is to train tomorrow's leaders today, through effective environmental education programs. Many group interaction techniques can be used effectively with junior high, high, and elementary school classes. By involving students in problem-solving, participation-oriented activities, the information retention level can be raised 85 percent. Facilitation, role-playing, and simulation are excellent methods of promoting group interaction. Gaming and task-oriented activities foster participation, challenge students, and make learning enjoyable.

Within the past 50 years, urbanization has taken its toll in the United States, both in thought and in physical character. Urban communities have grown to where over 70 percent of this country's population resides on less than 2 percent of the nation's land surface. Urban sprawl has added a third level--suburbia. As a result of urban and suburban growth, the independent rural-oriented living that once was characteristic of this country's social and political heritage no longer dominates the lives of most Americans.

Despite the physical separation from a genuine rural setting, emphasis has pivoted toward environmental concerns. The focus, nationwide, is on simple living, recycling, keeping in shape, health foods, and, in general, getting "back to nature." Advertisements show the

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"soft spots" of society featuring clear mountain streams, wild rivers, and flowering meadows. People climb trees and walk barefoot in mud puddles. The attitude is certainly "Environment Now."

Nationwide, professional educators are realizing that the day for environmental emphasis has come. All of a sudden, people want to know all there is to know about everytning. Yesterday's blind acceptance has become today's demand for justification. In order to meet the challenges of our growing society, students need training. The adult leaders of tomorrow must be dealt with today. Environmental appreciation is not an automatic product of the times. Even if it were, appreciation is not enough. Often, behind the colorful pictures and pretty songs, lie only traces of real concern. A realistic understanding of environmental processes, cycles, and interrelationships is often lacking. In a sense, the "environmental concern" era has painted castles in the sky; the time has come to build foundations under them.

Basic Techniques

"Environmental education is aimed at producing a citizenry that is knowledgeable about the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution" (University of Michigan, School of Natural Resources, 1975). The keys for effective environmental education are knowledge, awareness, and motivation. Basic environmental knowledge is fundamental; it can be transferred relatively easily. Awareness and motivation can be taught only by example and experience.

Though much basic knowledge can be directly taught (i.e., through lecture) the retention level of this method of knowledge acquisition is usually less than 35 percent. By involving motor skills and processes of problem solving, the retention level can be raised to 80 percent (U. S. Dept. Agriculture and U. S. Dept. Interior, 1977).

Many teachers across the country are experiencing great success with a technique called facilitation. Facilitation is a method of stimulating group interaction. It utilizes a group problem solving approach to learning. A facilitator is not a teacher, but a mediator who provides direction and maintains order for a group. Facilitators ask precisely worded questions to focus the attention of the group. They listen to their group members and accept their responses. They do not voice their own opinions or restrict responses. Above all else, a good facilitator maintains an atmosphere which centers the focus and attention on group members--not on the facilitator.

The mottos of facilitation are "None of us is as smart as all of us," and "Each member has an important contribution to make to the group." The goal of facilitation is total participation.

Facilitation training is available through various federal, state, and local agencies. The U. S. Forest Service offers facilitation workshops nationwide, and free materials involving facilitation may be requested from any of their regional offices. Synergy workshops deal with relatively similar methods.

Schoolyard Activities

Field trips are excellent tools for environmental education; however, the number of quality field trips allowed is usually severely limited. The schoolyard offers a host of opportunities for environmental education in the out-of-doors. Since it is so easily accessible, trips to the schoolyard can be more frequent, providing more examples and more experience. The possibilities for activities there are limitless.

The U. S. Forest Service in Portland, Oregon has lesson plans available for a series of field investigations called "Investigating Your Environment" (U. S. Forest Service, 1971). The set is free and will be mailed on request. (See Literature Cited for address.) Most of these activities require little or no equipment, involve many subject areas, and can be conducted in almost any schoolyeard. Though most investigations require more than one class period, each is broken into several tasks that can be stretched over several class periods to completion.

Games can be used with many facets of environmental education. To illustrate plant diversity, students can be given a loop of string and directions to situate the loop so that it encompasses the greatest number of different plants. Or, students can be asked to determine how many different trees there are on the front side of the building. This can lead into other tasks: determining what type of trees they are or pointing out similarities and differences among them.

Many such discovery games also exist, and some involve interactions. Scavenger hunts are excellent mechanisms for promoting participation.

These games can be refined to involve thought processes such as comparisons and analyses. For example, students could be asked to find the most recent addition to the area or the oldest component. They may focus on cycles and identify specific functions or other processes and label relationships. Sensory perception can also be involved (Woodall, 1979). A sample hunt may include:

(1) Find something that is getting smaller (or larger);

(2) Find two things--one that is responsible for the other;

(3) Find a reason to smile;

(4) Find something that looks warm, but isn't; and

(5) Find something that is producing energy.

With a little imagination, a game can be invented on almost any topic that creates not just a learning experience, but an enjoyable learning experience. Learning can be fun. It is important to keep in mind the motivation aspect of environmental education. Enjoyment gives that extra boost.

Many teachers do not take their classes outside because they do not feel comfortable in an outdoor situation. A "comfortable situation" will only come with time. Going outside with an attitude of sharing experiences and learning together will eventually create a comfortable situation.

Classroom Activities

On some days and in some situations, going outside just is not an option. This does not present a problem, since many of the most effective

environmental education experiences can be accomplished in the classroom. Simulation is an excellent means of teaching. The world of make-believe has a great deal of quality experience to offer.

Many environmental education activities can be adapted to indoor simulated situations. For example, directions can include "You have been led to a beautiful mountain stream. For the past several hours you have been collecting organisms, both plant and animal, from the stream. You're tired and incredibly muddy, but still quite anxious to analyze the stream." At that point, specimens or full descriptions of specimens can be distributed to the students so that they can analyze the stream environment. It helps to add reality to simulation by making comments throughout the process such as "Did you see any animals larger than this one?", or "Did you think the water was cold enough for this organism to live there all year?". Through simulation, students can benefit from an investigative experience--even if much of it is "pretend."

Simulations such as those discussed above can use observations of the outdoors made from inside the classroom. The windows provide access to a great deal of environmental information. In any case, given a situation, some date, a problem, and a little time, the results will usually be favorable.

Role playing is another useful tool in developing ideas and presenting both sides of an issue. One method is to set up a "true-to-life" situation and assign students to debate both sides. For example, a court hearing can be set up to determine whether a mountain range will remain a wilderness area or be developed into a ski resort.

Students can be assigned to play the roles of judge, developer's attorney, environmentalist's attorney, and various individuals who might testify for or against development, such as Sierra Club members, skiers, National Park Service employees, representatives from local businesses, and so forth. A few reminders about the financial benefits of development may start the action.

These examples are but a few from masses. There are no real "recipes" for effective environmental education. Different methods work for different people. Some activities have been used repeatedly with consistently good results. Proven activities allow for a confident beginning; additional ideas should be tested and added to the pool.

Interest and imagination on the part of the educator are the major factors required for quality environmental education. Student involvement is the key. "Tell me, I'll forget. Show me, I may remember. But involve me, and I'll understand" (U. S. Dept. Agriculture and U. S. Dept. Interior, 1979).

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OPERATIONALIZING A SUCCESSFUL OUTDOOR EDUCATION EXERCISE

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ABSTRACT: This paper presents six guidelines for planning outdoor education exercises. Their utilization is then illustrated in an exercise on ecological succession. Though success cannot be guaranteed, its probability can be significantly increased if these guidelines are followed.

How can a teacher who has never utilized the out-of-doors do so and guarantee his/her students a successful learning experience? First, successful learning experiences, regardless of whether they are indoors or outdoors, cannot be guaranteed. However, one can "load the dice" so to speak, or significantly increase the probability of a successful outdoor learning experience by following these guidelines (Koevering and Prell, 1980):

1. Teacher Preparation - Students will be most attentive when the teacher is well prepared. Preparation includes being familiar with the site in terms of its fauna, flora, soil, water, topography, and climate. Teachers who are able to discuss the land and/or resource use history are more effective in helping students speculate on the future of an area. Interesting facts, legends and folklore, and nature tips are also helpful in maintaining student interest.

2. Student Preparation - Students react more positively to situations that are (1) new and challenging and (2) extensions of classroom experiences. However, they must be given enough direction to feel comfortable with the assignment.

3. Flexibility - Teachers who are flexible during the field trip and take advantage of the dynamics of outdoor areas, as well as serendipity, are better able to excite students' interest than teachers who focus only upon inanimate aspects of the environment. Remember, students relate more positively to the living environment.

4. Questioning Strategy - Activities of greatest interest to students are those that employ some type of questioning strategy and allow for open-ended and student-oriented discussion. One approach successfully utilized by the Forest Service is the sequential use of questions which allow students to interpret their own observations--open questions (e.g., What do you notice about that soil profile?), focusing questions (e.g., What are some things that are found in the soil?), interpretive questions (e.g., Why were the two soils different in color and texture?), and summary questions (e.g., Based on our observations and discussion, what can we say about the soils found in this area?)--(see USDA Forest Service, 1978).

5. Student Involvement - This is the key to success. Students relate positively to "hands on" tasks, use of equipment, and the collecting of what they see as meaningful data. How meaningful the data is will be dependent upon implementation of guideline two--Student Preparation.

6. Competition - Competitive activities provide "icing on the cake." Outdoor areas are ideal for activities where comeptition can produce a set of "winners" from those who are not the usual outstanding students.

Putting These Ideas to Work

The above considerations were utilized in developing and implementing a unit on ecological succession for ninth graders. The unit was tested over a 2 1/2 year period and comparisons with the traditional approach (i.e., lecture alone) revealed a marked improvement in understanding the total concept of ecological succession. The development and implementation of this outdoor exercise can best be understood by dividing it into three chronological steps--pre-trip, field trip, and post-trip.

Pre-Trip

This involved both teacher and student preparation. The first step was identification of objectives; as presented to the students these included four behavioral objectives:

1. You should be able to describe the concept of ecological succession in 50 words or less.

2. You should be able to identify, in correct order, the six stages of ecological succession studied on the field trip.

3. You should be able to differentiate among the six stages of ecological succession studied on the field trip by describing each stage in terms of its soil texture, soil color, soil temperature, soil moisture, soil organic matter content, depth of humus/leaf litter, kinds of fauna and flora, frequency of floral species, dominant flora, shade tolerance of flora, amount of light reaching ground surface, and air temperature.

4. You should be able to describe the importance of ecological succession to life in 50 words or less.

During this period the teacher visited the area, which was the Indiana Dunes Lakeshore located at the southern end of Lake Michigan, in order to become familiar with the six stages of succession which characterize that area (i.e., I. Beach, II. Dune Grass, III. Cottonwood, IV. Pine, V. Oak, and VI. Beech-Maple). Field trip equipment (i.e., soil probe, soil and air thermometer, ruler) and vegetative sampling techniques (i.e., quadrant survey) were tested and a trial run was conducted in order to determine time required for completion of the exercise. Slides were also taken at each of the six stages for the purpose of orienting the students to the area prior to the trip.

Student preparation was begun three weeks prior to the field trip. The concept of ecological succession was introduced via a film. Class discussions centered around environmental changes in soil/humus/leaf

litter/fauna and flora/soil and air temperatures/shade tolerance of flora/ and light penetration--resulting from ecological succession. (Some of these subjects, such as differentiating soil types, required hands-on practice prior to the field trip.) Terms such as primary succession, secondary succession, pioneer stage, intermediate stage, climax stage, indicator species, dominant species, etc. were identified and discussed. Studies of last year's class engaged in the exercise on-site were shown to familiarize (and excite) the students with (about) the area.

Equipment and the vegetative sampling technique were also demonstrated and practiced beforehand. Students were directed to identify (or collect samples in the case of unknowns) and conduct frequency counts of flora and fauna (including insects) within each stage via the quadrant survey method (i.e., trees within a 100 x 100 foot square, shrubs and other woody vegetation within a 10 x 10 foot square, and non-woody vegetation within a 1 x 1 foot square). Catalogues for leaf presses and baby food jars for insect collection were collected in anticipation of finding plants and insects which could not be identified on site.

Finally, the class was divided into six teams with each team assigned a specific stage. Members of each team assumed certain responsibilities (e.g., recording of data, soil measurements, temperature measurements, etc.). These responsibilities were double-checked to insure that all students would be fully involved in the exercise.

The Field Trip

The field trip required a full school day. Before each team began their exercise, the class walked through the six stages. Students were urged to observe and ask questions. During the walk the teacher focused on student interest on living organisms and serendipitous happenings (e.g., the collapse of houses built on sand dunes, blowouts due to storms, etc.). Past, present, and future land uses were also discussed and speculated upon, as well as the formation of Lake Michigan through glaciation, nature tips (e.g., edible plants), and Indian folklore.

Upon completion of the class tour, each team was assigned an area representative of an appropriate successional stage, and began data collection. Since it was impossible for the teacher to be at six different sites at one time, a teaching assistant accompanied each team. Slides were also taken of students engaged in their exercise.

The element of competition was added by using the pre-determined time required for completion of the exercise; this differed among the six stages due to differences in the density of vegetation. The team completing the exercise closest to the pre-determined time was declared the winner and given a "funny" aware (e.g., jelly beans).

Upon completion of the exercise, the six teams were brought together and their observations were discussed, questions answered, and findings summarized. The discussion was structured to allow students to interpret and summarize their findings (see Forest Service, 1978).

Post-Trip

Two weeks were allotted for this period. Each team was required to present their field data, in an organized manner, to the class. This information was then synthesized by the students via charts, graphs, and diagrams (e.g., cross-tabulations of soil temperature by successional stage, line or bar graphs representing the variety of vegetation found in each stage, etc.). Data provided in this manner clearly demonstrated the number and degree of environmental changes which occur in ecological succession. This assignment also illustrated the importance of succession: environmental conditions clearly improved from Stage I to Stage VI (i.e., from hot and dry with sandy soil and few life forms to cool and moist with organic soil and a variety of life forms). The unit was concluded by showing slides taken during the field trip.

Summary

Outdoor education opportunities are just "out the door" for most teachers. If properly planned, the experience should benefit both teachers and students. Regardless of whether teachers have or have not previously utilized the out-of-doors, they will find a pleasant yet stimulating (learning) environment. Students, of course, will benefit from a hands-on experience with the real world. Try it, it will be a SUCCESS!

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THE NEED FOR MARINE EDUCATION

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ABSTRACT: Our world is becoming increasingly dependent upon the oceans to supplement the dwindling resources of the land. As we realize how much greater dependence we are placing on the oceans to maintain our standard of living, we suddenly find that we have adversely affected our coastal environments by shortsighted planning.

The degree to which plans are effective in preserving our coastal resources depends upon how the people "feel" about themselves and their land. Decisions made at various levels of government will be conditioned by public pressure or lack of it. Clearly then, public education in North Carolina should make a strenuous effort to alert students and adults to the problems and to provide them with the background which will aid in making the necessary critical decisions.

The critical needs in marine education for the state of North Carolina are:

1. To provide educational leadership.
2. To provide training in marine education.
3. To provide marine education curriculum.
4. To provide marine related career opportunities.

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THE NEED FOR MARINE EDUCATION

Our world is becoming increasingly dependent upon the oceans to supplement the dwindling resources of the land. In a letter to Congress on March 29, 1961, President John F. Kennedy said, "Knowledge of the oceans is more than a matter of curiosity. Our very survival may hinge upon it" (Goodwin and Schaadt, 1978). In the second environmental message of his administration, President Carter formally named 1980 as the "Year of the Coast" in order to focus public attention on the value of the coast and on the dangers of further degradation of its vitality (The Marine Newsletter, II(1):1). Mankind has harvested fish since before written history, but we are just beginning to explore other opportunities, such as the sea floor mineral deposits. Yet, the sea is much more than a storehouse of resources. It is the primary source of oxygen we breathe and the rain for our crops. The circling sea is a great heat reservoir which exerts a moderating influence on the climates of the earth and makes the Temperate Regions habitable by humans (The Marine Newsletter, II(1):1). The sea has served mankind for centuries as an avenue of commerce and has provided esthetic inspiration for people who live, work and play by its waters (Kennedy, 1961).

As we realize how much greater dependence we are placing on the oceans to maintain our standard of living, we suddenly find that we have adversely affected our coastal environments by shortsighted planning.

North Carolina's ocean shoreline extends for approximately 315 miles, from the Virginia border near False Cape to the South Carolina

line at Little River Inlet. Within this coastal zone are twenty counties. North Carolina's estaurine system is the largest on the Atlantic coast and occupies approximately 2,327,000 acres of marsh, creeks, rivers and open sounds (Baker, 1975).

North Carolina's growth and development have been intimately tied to its coastal region. The European settlement in North America began on the coast of North Carolina. During the Colonial and Revolutionary periods, the center of the state's population was near the coast. The coastal sounds and rivers were ports of entry and major routes of commerce (North Carolina Coastal Management Program, 1978).

The coastal region is one of the state's richest in history and folklore, as well as natural resources. The search for the lost colony, the tales and legends of Blackbeard's buried treasure, the "Graveyard of the Atlantic," the lighthouses of the Outer Banks, wild ponies grazing on the isolated islands, the location of Confederate forts, Kill Devil Hills and the Wright Brothers' National Memorial, old landmarks in the towns of Bath, Beaufort and Edenton, and Tryon Palace are some of the more famous links to North Carolina's past.

Fortunately, many biologically and geologically unique natural and scenic features are being preserved and managed by the state or the federal government: Croatan National Forest, Cape Hatteras and Cape Lookout National Seashores, Hammocks Beach, Goose Creek, Dismal Swamp, Merchants Millpond State Park and Holly Shelter Wildlife Management Area. However, there are additional fragile ecosystems that need to be managed wisely to prevent their total disappearance: our state's highly productive salt marshes, remnant strands of Atlantic White Cedar

throughout the Dismal Swamp and smaller swamp forests, open areas in transition from pocosin to sandy savannahs where Venus flytraps, pitcher plants and other insectivorous plants grow (Baker, 1975).

Archeological sites in the coastal areas contain evidence of Native American cultures as early as 8,000 - 10,000 B.C. Many surface finds point to yet unexplored prehistoric sites. These sites are not being maintained or reconstructed at this time (Baker, 1975).

The coastal region's history, geography and natural resources have combined in the past to make agriculture, forestry and fishing the major economic activities. The same factors are today making tourism, recreation and industry the major economic activities. Isolation is giving way to an influx of tourists, summer residents, automobiles and the supportive highway systems. Now land is the all important commodity.

Residential homes and tourists accommodations sprawled along the sounds and outer banks are creating problems in sanitation services and traffic patterns. The placement of highways, airports, waterways, ports, railroads and power plants threaten the natural stability of the coastal ecosystems. Badly designed development is interfering with the natural barriers to such hazards as hurricanes, beach erosion, and flooding.

In 1978, the state's fishing and seafood industry grossed $324,600,000 (Stick, 1958). Ninety percent of the commercial fisheries' production was either harvested in the estuaries or was comprised of species dependent on the estuaries for one or more critical stages of their life cycle. Yet in recent years, North Carolina has suffered a diminished commercial potential because of estuarine pollution resulting from improper sewage treatment, increased sedimentation, and

industrial discharges. Of the 2 million acres of potential shellfish growing areas in North Carolina, approximately 500,000 acres cannot meet the necessary stringent quality standards, due primarily to excessive coliform bacteria counts (Neumann).

Perhaps North Carolina's most valuable resource is her "people." The natives of the coastal region "have created a valuable and unique culture by living in harmony with nature and its industry." Dr. A. Conrad Neumann, Professor of Marine Sciences at the University of North Carolina, in a personal statement entitled "Scenery for Sale" places man in his proper perspective as a dominant force that affects the coastal systems. "Man is a part of the natural scene of these islands now, and no discussion of conservation should exclude or discourage the 'people' part of the picture. We should be as concerned with the preservation of a way of life as with the conservation of a piece of land" (Lindbergh, 1973).

Recent legislation requiring coastal zone planning has been a major step forward. The degree to which plans are effective in preserving our coastal resources depends on how the people "feel" about themselves and their land. Decisions made at various levels of government will be conditioned by public pressure or lack of it. Clearly, public education in North Carolina should make a strenuous effort to alert students and adults to the problems and to provide them with the background which will aid them in making the necessary critical decision.

At present, the critical needs in marine education for the state of North Carolina are to provide:

1. Educational leadership: teachers, educational specialists, potential administrators and community youth leaders with the knowledge and instructional skills to introduce marine education into the state's existing public school curriculum and community programs;

2. Training in marine education from a multi-disciplinary approach at the state's principle teacher-training institutions;

3. A kindergarten through twelfth grade multi-disciplinary marine education curriculum for the public schools; and

4. Marine related career opportunities for the young people in the state's coastal regions.

Three projects in the state are directed at meeting these needs. The first is a program of marine education that has been established at East Carolina University within the existing graduate program of the Department of Science Education. The function of this program is to provide advisory and coordination services for students who wish to prepare for leadership capabilities in marine education. Each program of studies is designed to meet the career goals of the participants, the requirements for a Masters of Arts in Education degree, and the specific requirements in the participant's field of study or concentration. The most distinctive component of this program is that each participant must spend a substantial continuous portion of one semester as an intern in one of the state's marine education facilities (e.g., the North Carolina Marine Resources Centers or the Hampton Mariners Museum).

The second project that will impact marine education in North Carolina is a career education project entitled "Community Based Program for Marine Education" funded by a grant from ESEA, Title IV-C. Directed by Carteret County Schools Vocational Director, Richard L. Rogers, the project staff is developing marine vocational education

materials to teach relevant skills to high school students who aspire to a career in commercial fishing or other marine related industries. The objectives of the marine occupations curriculum are to:

1. Teach students to respect the marine environment;
2. Develop skilled workers for the marine industry;
3. Teach students to accept and include as part of their diet underutilized species;
4. Accelerate the development of manpower for North Carolina's seafood industry; and
5. Expose students to career opportunities in other marine related occupations.

The third project that will have an impact on marine education in the state is the Dare County Marine Education Project, also funded by a grant from ESEA, Title IV-C. The function of Project CAPE (Coastal Awareness in Public Education) is to develop a multi-disciplinary K-12 marine education curriculum. During the 1979-81 school years, Dare County classroom teachers were involved in writing units for grades one through twelve. The units are to be field-tested in Dare County classrooms, revised, and published during 1981 and 1982. During the third year of the project, staff development workshops will be held at each of the state's regional education centers.

The units are being developed by sound infusion techniques--each lesson is keyed to the grade level courses of study and competency goals that have been published by the North Carolina State Department of Public Instruction.

The Dare County project is an example of the kind of inter-agency cooperation that can be brought to focus on a state need. Advisors for

the project are staff from the Divisions of Development and Science Education of the State Department of Public Instruction, the Regional Education Center No. 1, the Office of Marine Affairs, and the North Carolina Sea Grant College Program. Headquarters for the project have been provided by the Marine Resources Center at Manteo. The Director of the project is Dr. Carolyn H. Hampton (co-author of this article), whose time is being leased from East Carolina University.

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PEOPLE ARE A PART OF THE PICTURE

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ABSTRACT: For many people, the environmental and conservation movements have been seen as all we need to know and all we need to be concerned about in the wide and deep subject of Environment. Unfortunately, these movements have, for the most part, left out people. Almost by definition people are left out. The "New American Webster Handy College Dictionary" defines conservation as: "a noun meaning preservation, esp. of natural resources." People aren't generally considered natural resources--and probably all too often we are neither natural or resourceful. Environment is defined in the same paperback as: "a noun, the aggregate of surrounding things or conditions; the totality of external influences on an organism." Note "external" and "on an organism." Again people are left out! Why do we need to include people? This paper addresses that question from an environmental health perspective.

For years in the minds of many, the Environmental Movement and the Conservation Movement have been seen as all we need to know and all that we need to be concerned about in the wide and deep subject of the environment. But these movements have very largely left out people! We have devoted considerable energy and resources to "Save the Redwoods," "Save the Ducks," "Trout Unlimited," and the preservation of the wilderness. But people concerns are often left out--and I think people are important also. Almost by definition people are left out. The "New American Webster Handy Dictionary" defines conservation as: "a noun meaning preservation, especially of natural resources. People aren't usually considered natural resources--and perhaps all too often are neither natural nor resourceful! Environment is defined in the same

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paperback dictionary as: "a noun, the aggregate of surrounding things or conditions; the totality of external influences on an organism." Note, "external" and "on an organism." Again people are left out.

It is easy to understand why, in the minds of sensitive, intelligent persons that nature, natural things, wildlife, and wilderness are all so very important.

It is easy to understand why we, almost all of us, feel recreated when we are able to spend a few hours, a few days or weeks with nature. During hundreds of thousands of years our ancestors lived only with nature. They were obliged to "tune in"-to fit in with nature or they would not have survived. Indeed, we would not be here if adjustments and accomodations had not worked. Yet, in spite of this, we still hold or tend to hold the perspective of man apart from nature. This is where we usually see ourselves. We accept the definition of environment: "the totality of external influences on an organism." We are here and the environment is out there ⟶ . Right? Wrong. We are not apart from the environment: we are a part of the environment. We are a part of nature. What are the implications of this fact? There are many. However, one consequence which receives too little attention is that there are in nature many things that make us ill. This statement is not a startling revelation, I'm sure. But what does startle me and sometimes anger me is the fact that the causes of these illnesses, where they are found and how they may be prevented, are seldom taught in our schools. They are not often taught in K-12 and at the college level very little unless one is a "health" major.

But, you say--"wait one minute! We have units in K-6 curriculum on health." O.K., and you may teach most or all of the sort of material that I'm going to suggest. If you do, you and probably your school system are somewhat unique.

Let me describe what I believe to be the more usual health content of typical early grade school studies. Please allow me to reminisce about my school days, because even though this was a long time ago, perhaps things have not changed a great deal. Also permit me a bit of hyperbole. Health classes are usually rainy-day activities and on days when the children can't be taken outside to run and play for exercise, muscle development, skill development, and fresh air and sunshine.

Don't misunderstand me--there is no substitute for fresh air, sunshine and exercise. Not only is the outdoors very healthful for the children, but it is a nice break for the teacher! My objection is that discussion health only when it rains does not do justice to the important subject of the preservation of human health. Especially when there is a drought.

However, let's suppose we have a good rainy season. What then do the children usually study about health? One big thing is learning how often to take a bath--like once a week and to use soap. I remember my third grade teacher taught us how to shampoo our hair. She said if we didn't have real shampoo, (most of use didn't as we were poor folk and it was also the depression years), we could use regular soap and lather/rinse twice.

Also, every year there is a unit on "How to brush teeth and be sure to." The five foot toothbrush and the giant set of choppers are brought

out to demonstrate technique and allow the students to practice. One year they are admonished to brush side-to-side, the next year up and down is recommended. Perhaps the circular motion is judged best the next year. Then there is anatomy. Favorite subjects here are eyes and ears. Models are again important. Remember the two-foot diameter plastic eyeball? It was all properly labeled with perhaps an opening so you could see the retina. And then, thank goodness, there is a long dry spell.

So, back to muscle development, or perhaps in the last ten years to some nature study (often called environmental studies). Again, before I'm branded a disbeliever, let me stress that all of the above has merit, but it should not be all that is taught about human health. What are called environmental studies do not, as usually given, provide health information about the environment.

Have you heard the definition of health that is given in the preamble of the World Health Organization Charter?

Health is the state of total well-being, physical, mental, and social well-being, and not merely the absence of disease or infirmity.

This is a very positive and idealistic definition. It is also quite comprehensive. Social, mental and physical well being! What is our health status by this definition? We can see a part of the answer by looking at some statistical indexes and some rates--(Iknow statistics are a bore, especially late in the afternoon) but-- .

Generally used indexes of social/mental health levels are divorce rates and crime rates. Both have increased in North Carolina in the last ten years. The divorce rate in North Carolina in 1970 was 2.7 per

1,000 population. In 1976 it had jumped to 4.4 per 1,000 population. The same year the marriage rate was 7.8/1,000. Thus, more than half of the marriages are ending in divorce.

The most widely used index of general health status is the infant mortality rate which is the number of babies that die before one year of age out of each 1,000 babies born. Looking at the United States, we cannot be very pleased that our country ranks 17th in the world--16 countries have lower infant mortality rates than we have. And within our country, North Carolina has a higher infant mortality than the national average.

The infant mortality rate for North Carolina in 1972-76 was 21.6/1000--over 21 of every 1,000 babies born in North Carolina died before reaching their first birthday. When this is looked at for white and non-white population, it is even more startling:

for white - 16.5/1,000

for non-white - 28.9/1,000

The infant mortality rate for Hyde County for this same period 1972-76 was 33.2/1,000.

Death rates are sometimes reasonable indicators of general health, especially if they are age specific. In Hyde County the 1972-76 death rate for the 0-4 year age group was 6.2/1,000.

What do these babies die from? What kills our children? Not cancer, stroke and heart disease (leading killers of older folk). Infectious diseases and accidents are leading causes of deaths in children.

In North Carolina the rate per 100,000 persons for Shigellosis (bacillary dysentery) and Salmonellosis (bacterial gastroenteritis) overall is 26.2. However, for the under 5 year age group it is 170.2; 5 to 15 years, it is 35.2; 15 to 24 years it is 11.0; and over 24 years it averages 7.

Rocky Mountain Spotted Fever - North Carolina has the dubious honor of leading the Nation in the number of cases of Rocky Mountain Spotted Fever in each of the last six years! This year it appears that South Carolina may be catching us, but it is still mid-season. We have about 250 cases reported per year. The rate is about 5/100,000 overall. But the disease occurs more often in the young than in the old. Age specific rages show:

Age	Rate
Under age 5	6.0/100,000
5 to 14	10.1/100,000
15 to 24	3.7/100,000

Highlights of these diseases' statistics are that Shigella/Salmonella occurs more often in the under 5 year age group.

Rocky Mountain Spotted Fever occurs more often in the 5 to 15 age group.

A similar examination of Infectious Hepatitis shows it highest in the 15 to 24 age group.

Of course, there are many other diseases and conditions we could review--and perhaps should. However, the examples of what might be included in the curriculum are from the three diseases: Shigella-Salmonella, Rocky Mountain Spotted Fever and Infectious Hepatitis.

Because the time is short and the afternoon is hot, I want to quickly summarize the possible "content" of lessons about the three diseases. (This is where I'd like to go on for hours because I find epidemiology so fascinating!) What I have time to share here are the barest of outlines and suggestions.

Since Shigellosis, Salmonellosis and Infectious Heptatis are intestinal diseases and are contracted when a person drinks contaminated water or eats contaminated food, we may look at them as a group.

What causes? Specific bacteria and a virus:

Shigella sorei
Salmonella sp.
Hepatitis A. virus

How do they get into food and water?

Feces
Fingers
Flies
Fomites

Because of:

Poor personal hygiene;
Improper excreta disposal;
Unprotected, unsafe drinking water supply;
High fly populations;
Unprotected, contaminated food stuffs.

And in all of this, children are most affected.

Rocky Mountain Spotted Fever is probably the most mis-named of our diseases. The "fever" part is usually right, but not always spots. And when we get to "Rocky Mountain," no way! Idaho, Montana, Wyoming and Colorado have about eight cases of Rocky Mountain Spotted Fever per year. North Carolina alone has about 250 cases per year with Virginia

and South Carolina both having almost as many. And it occurs more than twice as often in persons under 15 years of age than in those over 15.

And, indeed, here is an outdoor activity!

What causes? Rickettsia rickettsi

Where found? In ticks

In the southeastern United States (that's us), the tick is Dermacentor variabilis, the Dog tick.

How do people acquire the disease? From the bite of an infected tick. And we know how we acquire ticks. Go out to study nature!

Actually, this is a very interesting disease that is good to study--the biology of the tick is fascinating; and in April, May, and June, collecting ticks to identify is quite easy.

I've said these things in a light manner, but they are serious subjects. They also can be taught effectively to 5 year olds. My wife, who is a kindergarten teacher, has done so.

Perhaps by now you are saying to yourself (or your neighbor) "What is this guy doing on a program whose theme is "Outdoor Education"?" He's talking about diseases that make babies and other young folk ill and sometimes kills them. Perhaps you think this is important but don't see it as related much to the outdoors.

Well, I think it is. Outdoor Education always includes studying the environment and I feel safe in saying that most of our ills are related to the environment as a causal factor. If our children are taught about the environment but the sickness causing aspects are left out, we have left people out of the picture. We are not helping the children

develop a fundamental understanding about why the environment is so important. Also, the children should be taught how they may prevent diseases and protect their own health.

Anything else is malfeasance.

ENVIRONMENTAL EDUCATION IN THE 1980's

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ABSTRACT: As we face a decade with many critical environmental issues, it is extremely important that individuals realize how their actions, either single or as a group, affect the environment. Our society over the past several generations has become increasingly alienated from the natural world, resulting in a large portion of our population with little knowledge or experience with the outdoors. Therefore, people need to be introduced to the sights, sounds, and smells of nature. There are many excellent resources available today to assist teachers in developing outdoor education curriculum. These range from utilization of libraries to inviting members of conservation organizations or the state extension service to give presentations, organize workshops, or lead field trips. The primary objective is to teach observational skills that will motivate an interest, appreciation, and enjoyment of the natural world.

There once was a time when virtually every member of our society had some familiarity and experience with the natural world. However, over the past several generations, our society has become increasingly alienated from the outdoors. Transportation and technology has provided us with practically any food year round. Winter used to be a time when only preserved food was available; spring not only brought warmer weather, but also much appreciated fresh food.

Our culture tends to be sedentary and surrounded by controlled, artificial environments; indoor conditions remain constant regardless of the weather outside. Leaving the heated or air conditioned comfort of our homes, we enter our cars and then spend the day in another contrived environment at work or school. Returning home, a large portion

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of us slip into the world of TV for the rest of the day. The ramifications of these circumstances in our society is that we are now a people that know little of the natural world. Few of us have direct experience with natural processes and cycles, and little knowledge of what happens in the outdoors. Having taught several workshops over the past few months on various subjects around outdoor education, I have been sadly amazed at how little people know these days about growing and taking care of plants, and about what occurs naturally out-of-doors. Questions indicate a naivete and ignorance that is alarming.

Some people ask: "Why do we need to have an awareness of nature?" Simply put, we can no longer afford to be ignorant. We are facing a decade with many critical environmental issues. The list of endangered species, both plant and animal, grows longer every day. As population pressures increase, critical habitats are threatened; development increasingly engulfs land and other natural resources; pollution makes other areas unfit or dangerous not only for flora and fauna, but for humans as well. Modern technology has raised our standard of living, but it has also introduced noxious, toxic wastes into our environment. These wastes are not only poisoning fish and animals, but are also reaching humans through the food chain. At the same time, toxic substances are leaching into our water tables and waterways. Only the future will tell what long-term effects these factors will have on the environment, the plants, animals, and people.

If we are ignorant of how our actions affect the environment, then there is little or no chance of protecting the natural world and of stopping and/or reversing some of the current trends that so seriously

jeopardize the integrity of the environment. However, if we are aware of what the situation is and what the various choices are, then we can make intelligent decisions, based on knowledge, not on emotions and misinformation. If we want to maintain our current way of life, then we must assume the responsibility of preserving the natural world, or the news media in the future will carry reports of loss of human habitat as well as that of plants and animals.

Therefore, one of the tasks that we now face is the introduction of people to the natural world. The pace of life today is so hectic that many of us never notice much of what is around us. We must develop observational skills that will enable us to interact with the environment and become aware of the beauty, mystery, and majesty of the world around us.

Nature Hobbies and Modern Living

Another benefit of learning about the natural world is that nature hobbies can lead to a significant reduction of stress. Recent research and experience has shown that involvement in various types of outdoor activity can reduce and/or eliminate stress. Incroporating outdoor activity into daily routines can offer a welcome distraction that can be rewarding, fun and healthful.

Role of Teacher in Environmental Education

One part of being a teacher is acting as a role model for students. This principle is essential in outdoor education. If teachers exhibit a respect and interest in the natural world, then many of their students will catch that interest and enthusiasm. What students need today is an

exposure to the outdoors so that they may become more knowledgeable about what is happening to it. Even if in-depth knowledge and experience is lacking, teachers can still encourage their students to observe and appreciate the natural world. Resources are available that will help both student and teacher become more acquainted with the specifics of the outdoors. An important aspect of the role of the teacher can be to encourage this interest and investigation and to provide exposure to the outdoors. It should also be noted that is is not necessary to go any place special or to set up activities in order to enjoy and appreciate the natural world. Walking between school buildings, driving in vehicles, looking out windows can all be opportunities to take note of seasonal changes, interesting plants, or activities of animals--in short, a general awareness, appreciation and enjoyment of the outdoors. Specialized activities can be helpful, rewarding, and educational, but exposure to the environment need not be limited only to these activities.

The Concepts of Ecology and Conservation

Natural history used to be the term that ecology has now replaced. Both terms refer to the study of the environment and how the various living components interact. These are studied, not as isolated, individual parts, but rather in relation to the environment as a whole. This study is undertaken outdoors, not inside in a laboratory. It includes all the components of the natural situation--the air, water, soil, flora, and fauna, all of which are closely intertwined.

There are several concepts that need to be understood in order to fully appreciate all interactions in any environment. The total environment of the earth is divided into major classifications called biomes. These can be either on the land or in water (i.e., deserts, mountains, grasslands, forests, etc.). Within these biomes are habitats or the site where a plant or animal naturally lives or grows--their neighborhood. The next concept is community--the interrelated plants and animals that live in the habitat, each of which uses the habitat in its own way, and is usually affected in some way by the other organisms living in that specific habitat. Each organism fills its own niche, its peculiar role in the community--what and where it eats, where it nests, when it is most active and who its predators are. Within any community, no two species will occupy the same niche, a phenomena that reduces competition and allows for use of the total environment by all species in the community.

As human population increases, putting ever increasing pressure on our natural resources and the environment, it has become critically important for people to gain an awareness of the concept of conservation. In simple terms, conservation is the protection and preservation of our natural resources and the environment, in order to prevent destruction, exploitation, or neglect. Once a habitat is destroyed or a species becomes extinct, there is no turning back, but only an irretrievable loss. Every individual carries a responsibility to insure that their actions do not contribute to the destruction or exploitation of the natural world. We all share this world and our actions not only can affect plants and animals, but humans as well.

One of the tasks ahead, as discussed earlier, is for our society to start developing an awareness of nature. This basically involves learning to be sensitive to the sights, sounds, and smells of nature. Education is important in order to understand how our actions affect the natural world, the relationship between the environment and the life-style of a particular species, and the way in which all the various components of the environment, including humans, are interrelated. Hopefully, individuals will acquire a motivation to develop skills to interact with the environment at many different levels. This can be accomplished by setting up situations and activities where students can investigate the natural world by observing, collecting, recording, and interpreting information about various components of the environment.

One part of the concept of nature awareness is communicating the response to what is experienced. This involves sharing feelings, awareness, and values. Each individual experiences the world in his/her own way, all of which is dependent on various factors, ranging from time of day, to age, socioeconomic status, gender, etc. Sharing these varying experiences can provide an enriching, enlightening view of the world as we experience the world through different people's eyes.

When Do We Interfere?

"When do we interfere?" is a question that will come up sooner or later as people become more involved with the natural world. Rules that applied years ago are no longer valid because of severe pressures

due to population increases. As habitats have dwindled, the habitats remaining intact are becoming more and more valuable. Therefore, the simple act of picking wildflowers or foraging for wild food is no longer so simple. It's very possible to eliminate a species in an area by merely picking or digging up all that is available. These activities become less and less feasible as time goes on. The concept of conservation becomes more and more critical.

Occasionally, wild animals will be found that have fallen from nests. It is always very tempting to bring them home or to classroom, to raise them and then release them. This is no simple process, though, and requires time, energy, and knowledge to do it properly. A high percentage of animals will not survive. Those that do face a life of confinement, usually under less than optimum conditions. It is also extremely hard to release animals; their chances of survival are slim because they have had no role model of their own species to teach them waht they need to know in order to survive.

Resources for Teachers

Following are some suggestions for sources of information about the natural world, plus an overview of the various activities designed to involve the student in some aspect of the outdoors. This is by no means an exhaustive list, but it will introduce any interested teacher (or student) to the various available sources of information about the environment.

Libraries

Nearly all libraries are a wonderful source of information and stimulation for teachers and students alike. Excellent books are currently available on a wide range of topics concerning the natural world. Even though it is possible to enjoy the outdoors without being an expert naturalist, a little knowledge can expand and enrich any experience in the field. If you know something before you leave the classroom, then you can look for it in the field.

Don't limit the search for information to just your school library. Excellent books are also available at the public library, and at college or university libraries. Occasionally, garden clubs, birdwatching, hiking or conservation groups have specialized small libraries that may be useful. Information is catalogued under:

1. Nature
2. Nature Study
3. Natural History
4. Natural Sciences
5. Ecology
6. Outdoor Activities

Information may also be catalogued under specific topics (i.e., birds, mammals, etc.). Librarians can also direct you to related topics.

Speakers

Occasionally, you can invite speakers to come to your school to give lectures or workshops or to lead field trips. Extension service,

garden/hiking/birdwatching groups, Audobon or Sierra Clubs, or similar organizations may provide people with some expertise in various topics of the natural sciences. Local schools, universities or colleges may also supply people who can come to your school. Foolowing is a list of university departments that are often quite beneficial:

1. Agriculture
2. Botany
3. Ecology
4. Environmental Sciences
6. Entomology
7. Geology
8. Herpetology
9. Horticulture
10. Meterology
11. Mineralogy
12. Ornithology
13. Paleontology
14. Zoology

Subjects for Investigation in the Natural World

This list will give an idea of the various different areas of interest that it is possible to pursue. Investigation will be influenced by the time of year, the age group you are working with, and the area to be investigated.

1. Animals
2. Birds
3. Insects
4. Reptiles, amphibians, Fish
5. Soil and Rocks
6. Seasonal Changes
7. Flowers, plants, trees, seeds, fruits, grasses, etc.
8. Ecosystem in school, home, backyard, schoolyard, etc.
9. Water
10. Weather and Astronomy
11. Ecology - Habitats and Survival; Communities

Process for Investigation

This is basically a common sense approach to learning how to become a good observer. It can lead people to examine the different components of the environment and to help them understand how these components are related. This will provide an opportunity for people to interact with their environment at many different levels. It encourages people to analyze the physical, social, and economic impacts due to humans as they share their response to the experience by communicating feelings, awareness, and values.

Keep in mind that you do not have to go any place special to observe the natural world; it's right out your door. Nor do you have to set up a special activity. Share and encourage your students to share observations any time you are outdoors. Following is a simplified description of the investigation process:

1. Observe
2. Describe
3. Question
4. Interpret Data
5. Identify
6. Record
7. Share response to the experience by communicating feelings, awareness, and values

The following is an example of the process of investigation concerning animals and their environment. The first step is to observe and record animal sightings and/or the evidences of their presence (i.e., tracks, droppings, etc.). Compare habitats and explore

the relationships between animals within a habitat and how they are influenced by environmental factors. Observe and discuss animal adaptations in relationship to changes in habitats. Share responses to the experience by communicating feelings, awareness, and values. A basic question strategy throughout the investigation will encourage an in-depth look into the environment.

Activities for Students

Below is a brief list of some suggestions that may interest students in the natural world. Remember to be sensitive to the concept of conservation when collecting any plant material, being sure to always leave behind an adequate amount that can propagate itself. Also warn students about poisonous plants and the necessity of proper identification.

The activities will vary according to the age group you are working with, and the subject matter that you normally teach. (For example, Home Economic teachers may want to plant an herb and/or vegetable garden that can be incorporated into cooking classes; gardens can help botany or biology classes by providing direct observation of cycles, growth rates, etc.).

1. Collecting rocks and minerals, shells, insects and butterflies, plants (drying and pressing)
2. Gardening
3. Aquariums and terrariums
4. Craftwork
5. Photography
6. Fishing and hunting
7. Hiking
8. Camping
9. Birdwatching, bird feeders

There are many books available that can give specific details and ideas for various activities. (See attached reference list.) This list is just an indication of the variety of the opportunities available for outdoor education.

Sense Walk

The following exercise is designed to acquaint people with the natural world by providing an opportunity to experience and appreciate the sights, sounds, smells, tastes, and feel of the outdoors. (It was taken, in part, from an exercise designed by the hortitherapy program at the N. C. Botanical Garden.)

GOAL: To become aware of the natural world through the development of observational skills.

This activity can be tailored to fit the needs of the age group you are working with (simpler for the younger students and more complex for the older ones).

APPROACH: Using the five senses--hearing, seeing, feeling, tasting, smelling.

I. TALKING BEFORE THE WALK

Following is an activity that can be done before going outdoors, or as a prelude to a sense walk; but done at a different time:

Collect natural objects, i.e., stones, shells, seeds, feathers, sticks, plants, jars of dried herbs

The purpose of this exercise is to look at each object, closely and slowly, and then pass it on to the next person. Try to pick objects that provide a wide range of stimulation for the five senses: soft, rough, aromatic, colorful, patterns, etc. Encourage students to share observations, and discuss what is experienced.

Just before going on a sense walk, begin talking about sight (what we see). Go on to discuss the other senses.

Tell the students we will use the "5 Senses" on our nature walk. Name them again. Ask for what sounds, sights, smells, tastes, and touches we might encounter. Some examples are listed below; keep these in mind during the walk, and point them out only if the students don't do so first.

Examples

HEARING: crunch of the ground underneath, (it will change depending on what you're walking on), rattle of leaves, water flowing in a stream (cup hands behind ears to accentuate hearing), squirrels chattering, birds singing, birds or other animals travelling or scratching on the ground, voices near or far, hum or chatter of insects, running animals, falling needles/nuts/acorns/leaves.

TASTING: Explain that we are always cautious and must know before tasting that the plant is not poisonous. If you decide that the group can absorb the identities:

Sourness - Sourwood, oxalis, sheep sorrel
Bitterness - Indian tobacco
Sweetness - grapes, blueberries, strawberries
Aromatic - cherry bark, mint leaves, other herbs
Spicy - sassafrass leaves or roots

SMELLING: pine needles or cones, mint leaves, flowers, clay, rotting log, mushroom, sourwood, spicebush.

FEELING: the sun on your face (close your eyes and turn around), the wind (turn toward the prevailing wind and watch the direction the leaves are blowing), watch how a samara (maple wing) twirls in the wind, feel the temperature in the air and then in the leaf litter (notice the difference), the ground (lie down and feel the earth underneath you and dig your fingers into the ground).

SEEING: Use sight to distinguish shapes and colors. Shapes: the different leaf shapes (a) the 5-finger Cow Itch, the 5-part Virginia Creeper; (b) the tooth-edged leaves like Beech; (c) the lobed leaves like white oak; (d) the entire (Dogwood); (e) the pointed Black Oak; (g) the heart-shaped ginger. Notice fat hickory or oak and skinny willow. See the round shapes of berries and grates. See the line made by needles hanging from branches. Colors: sun on a leaf makes it lighter green. Bark is various colors and textures.

It should be noted that as the seasons change, the experience of the senses will change drastically; make note of these seasonal variations, possibly keep a notebook for observations of the natural world.

II. THE WALK

A STOP BY TREES--Let's use our eyes first. Are all the trees alike? How can we tell one tree from another? By its looks, just as you tell your friends apart. Was the tree always this size? Were you always the size you are now? Now let's rub our hands together really fast to make them more sensitive, and then feel the tree. Is it rough or smooth? (Try to find a rough and smooth tree for comparison.) Does bark cover your body? What does the tree need to live?

A STOP BY A ROCK--Is a rock alive? Is a tree alive? What does a tree need to live? (Accept their answers. They will expand on these as the walk continues.) Some things in nature are alive (like trees) and others are not (like rocks). Do living creatures make their homes under or on the rock? Look and see. Turn the rock over and watch the bugs and worms underneath. (If the children want to touch or catch the bugs, don't suppress such impulses but elicit from them that these are living creatures not to be harmed or taken from their homes.) Emphasize the role of the child in restoring the home as it was--do not disturb the natural setting. What are some other things besides rocks which are not living? (water, sand, sun) These non-living things are necessary to the living things in nature. Let's feel the rock. Is it cool or warm? (Is the sun shining on the rock?) Can we smell the rock?

BY AN OLD STUMP--What was this? What is happening to it? (Take a handful of the rotting material and give a little to each child to feel and smell. Then have them pick up some of the soil on which they stand, and compare the feel and smell to that of the rotted material.) The whole tree stump will one day be part of the soil.

BIRDS--Do you hear a bird singing? Do all birds sing the same song? Do you all have the same sound when you speak? How do we know the bird is singing? (We hear the song and if we are lucky we may see the bird singing.)

BY A STREAM--A great place to listen and feel. Hear the water go over the rocks and pebbles. Look for fish or water insects; are there animal tracks on the bank? Why do animals and birds come to the stream? Put hands in the water and feel.

MEADOW OR FIELD--Do all animals and birds live in the forest? Do all insects live in the forest? Let's stoop and see if we find any insects. Lie down and feel the ground like the insects (bugs) do. Smell the ground. How does that feel?

Do you see flowers? Can you hear a bee buzzing? Do you see a butterfly? (Can you hear a butterfly?)

III. AFTERWARD

Review the "5 Senses." Review what we saw on our stops. Review the living things and non-living ones, again pointing out their interdependence. Reinforce the importance of not disturbing or destroying the natural world--protect the homes and feeding places of the plants and animals in the woods, streams, and fields.

Keep in mind that it is not necessary to identify what you see--it is still possible to observe the natural world and enjoy all the various experiences offered to the senses. As time goes on, and students develop observational skills, it usually follows that there will be some interest in learning to identify.

REFERENCE LIST FOR THE "WHAT AND HOW" OF OUTDOOR EDUCATION

This list was taken, in part, from a list designed for tour guides at the N. C. Botanical Garden. It is by no means an exhaustive list, but provides information about various aspects of outdoor education. There are many more publications that are not listed but are excellent references on a variety of nature subjects.

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Individual copies may be obtained by writing:

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